EPILOGUE

Where do we come from?

Are we alone?

When the answers to

these questions are

known, our civilizations

will evolve new visions

of who we are and what

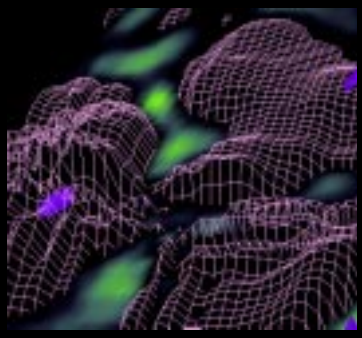
our futures might be.

Origins Horizon

Born of the extraordinary accomplishments of 20th century physics, astronomy, geology, and biology, the Origins program takes up the challenge of answering questions as old as our species. When Galileo first turned his tiny telescope to the night sky, he saw the Milky Way resolved into millions of stars, in one stroke expanding our grasp of the universe to a scale that had not been imagined from the sight of eyes alone. The growth of scientific culture and tools over the next three centuries revealed a vast realm, each at-first-incomprehensible discovery assimilated into an increasingly uncomfortable reality. The eruptive growth of 20th century astronomy has brought us an appreciation of how vast, old, and unearthly the universe is, and has left humanity struggling for a sense of our own significance consistent with the reality of who and what we are. But science has also given us something that will help, by promising answers to our ancient questions: Where do we come from? Are we alone? When the answers to these questions are known, our civilizations will evolve new visions of who we are and what our futures might be. Already we have learned enough to appreciate that the universe is enormous and ancient, but life—tiny and transient—is its precious jewel.

In the first few decades of this new century astronomers will largely complete the study of cosmology: the description of the universe on the largest scales and how it works. With the Space Infrared Telescope Facility (SIRTF) and the James Webb Space Telescope (JWST) we will also begin to write the final chapter of the story of galaxies, witnessing the actual birth of these continents of stars. In particular we will chart the13-billion-year history of the Milky Way Galaxy we inhabit, understanding how the materials for new stars, planets, and life were generated and distributed. SIRTF and JWST will also lead the way in studying the birth of stars with their families of planets, moons, comets, and asteroids, the cosmic Petri dish of life. Led by the Terrestrial Planet Finder, we will peer one-by-one at our hundreds of nearest neighbor stars and inventory their planets, searching for solar systems resembling our own with a balmy, wet planet like Earth. It will require much more ambitious telescopes such as Life Finder to detail the conditions of such a world, gathering far more light from a distant world, enough to see the signatures of life in the atmospheres of planets, evidence for seas and continents, for seasonal variations. We cannot yet know whether the worlds we seek are common or exceedingly rare, so our journey may eventually involve great flotillas of large telescopes that can

EPILOGUE



extend the search to thousands or tens of thousands of stars. By the middle of the 21st century, the Origins program could be compiling a vast catalog of tens of thousands of solar systems and monitoring the weather, climates, seasons, and biochemistry on hundreds of inhabited worlds. Machines almost beyond today's imaginings will be needed to scrutinize and perhaps even image the worlds we humans might someday visit, but if the will and spirit hold, physics says it can be done.

Will we humans leave our home in the solar system and begin to migrate over the Milky Way as we once spread over the Earth? From our view at the beginning of this new century it seems both inevitable and impossible. But, whether we make these future settlements in body or only in mind, our journey has surely now begun, and when we first find, in the orbit of a neighboring star, a planet resembling Earth, one where human beings might conceivably live, the quest could become an obsession. Perhaps our descendants will praise us for our initiative, perhaps they will curse the relentless curiosity that propels humans into greater accomplishments and greater peril, but our part in this drama is preordained, its resolution beyond our time and imagination, barely within our dreams. We go on.

— Alan Dressler